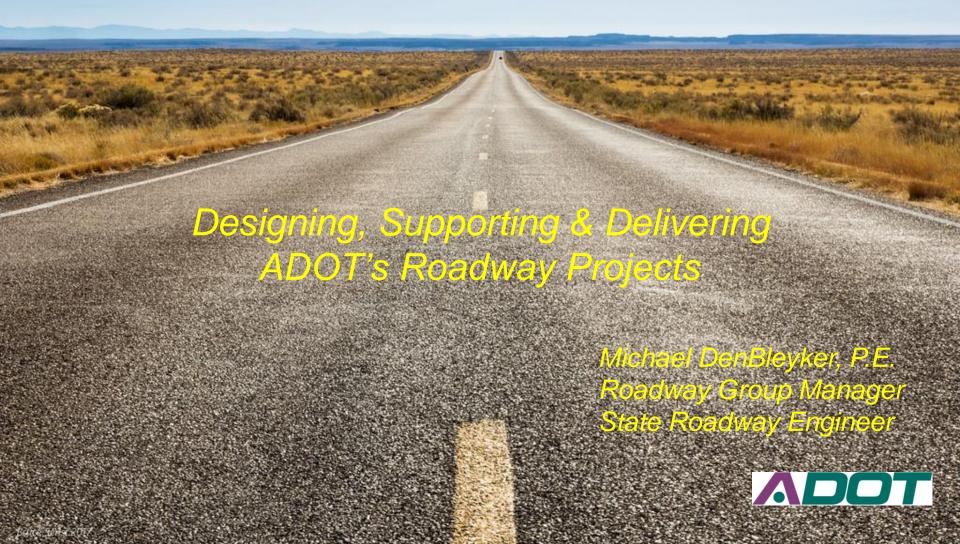
Roadway Engineering Group

Infrastructure Delivery and Operations Division



Roadway Design - What is Needed? What is the **Project Need &** What are the Environmental Existing Objective? Conditions? Utilities Road Are there Safety STATE OF ARIZONA ADOT DEPARTMENT OF TRANSPORTATION Considerations? INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION PROJECT PLANS What Design STATE HIGHWAY BITTER SPRINGS - UTAH STATE LINE HIGHWAY Parameters & Standards/Criteria Exist? What Project Risk Factors Exist? Structures/Bridges What is the Schedule? What is the **Budget?** HORSESHOE BEND OVERLOOK SOUTH OF PAGE Drainage PROJECT NO.089 CN 544 F0237 01C MASSING THE DELIVERY ME OF THE FEDERAL AID NO. 089-E(208)T Construction

Erosion Control/Landscape

Traffic

Right-of-Way



Who We Are and What Do We Do?



Hiren Shah

Roadway Survey

Section Manager: Virgil Coxon Location Chief Surveyor: Mark Luond Construction Chief Surveyor: Clifton Clark

Services/ Responsibilities

*Design/Location Survey *Construction Survey *Survey Support

Roadway Pavement Design

Section Manager: Reed Henry Ali Zareh Team Leads: Ashek Rana Scott Weinland

Services/Responsibilities

*Pavement Testing/ Cores/ Evaluation *Material/Pavement Design Reports

Roadside Development

Section Manager: LeRoy Brady Team Lead: John Hucko

Services/ Responsibilities

Sedimentation Control Plans

*Aesthetic Enhancements *Seeding & Revegetation *Landscape & Irrigation Design *Stormwater Quality & Erosion/

Roadway Standards

Section Manager: Reed Henry Team Lead: Chris Cooper

Services/ Resposibilites

*Roadway Design Guidelines *AASHTO Standards & Criteria *MASH Standards *Roadway Construction Details *Design Support

ROADWAY ENGINEERING GROUP

Manager: Michael DenBleyker Assistant State Engineer

Roadway Drainage

Section Manager: Syed Alam

Services/ Responsibilities

*Hydraulic/Hydrology Design & Standards *Drainage Permits *Scour/ Erosion Protection Design

Roadway Design

Section Manager: Doug Smith Team Leads: Jordan Kurlin Hassan Eghbali

Services/ Responsibilities

*Roadway Design Documentation *Earthwork/ Drainage Calculations *Construction/ Maintenance Details *Design Management and Coordination

Roadway Pre-Design

Section Manager: Reed Henry Team Lead: Shahid Bhuiyan

Services/ Responsibilities

*Project Scoping Documentation *Design Exceptions/ Variances *AASHTO Controlling Criteria *Change of Access Reports

Contact Information

Michael DenBleyker Manager.

mdenbleyker@azdot.gov 802.712.7808 Vingil Caxon vcoxon@azdot.gov

802.712.8580 Pre-Design, Pavement, Standards:

Survey:

dhenry@azdot.gov 602.712.8488 Drainage: Syed Alam

salam2@azdot.gov 802.712.8701 Roadside Development LeRoy Brady

lbrady@azdot.gov 802.712.4261 Design: Doug Smith dsmith2@azdot.gov

802.712.8482

Reed Henry

Roadway - Who We are and What We Do?



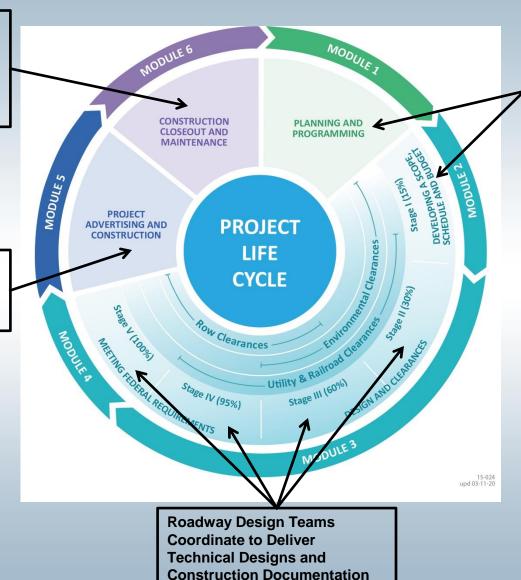
Pre-Design Survey (Scoping)		Pavement Design	Roadway Design	Drainage	Roadside Development	Standards	
Define the Scope, Schedule and Budget	Aerial Photography and Engineering & Topographic Surveys	Design of New Pavement and Recommendations for Pavement Rehabilitation Treatments	Prepare Roadway Technical Design and Construction Documents	Hydrology, Hydraulics and Water Resources Expertise and Design for Projects	Design of Landscape Architecture, Aesthetics and Environmental Design for Projects	Provide Technical Guidance & Expertise in Roadway Design Criteria	
Field Research	Construction Survey	Field Reviews & Testing	Records Review	Field & Records Research	Field Reviews	Roadway Design Guidelines	
Records Review	Field Survey	Records Review	Gather/Calculate Design Data	Roadway Drainage Calculations	Erosion/Sedimentation Control Plans & Specification	AASHTO Standards & Criteria	
Standards Research – ADOT & AASHTO Controlling Design Criteria	CADD Processing of data	Standards Research	Develop Roadway Sections, Alignments & Profiles	Hydraulic/Hydrology Design & Modeling	Vegetation Inventory	MASH Standards	
Coordination with Safety Studies	Aerial Drone Surveys & Mapping	Calculations & Pavement Design	Develop Roadway Design Plan Sheets	Modeling & Analysis of Washes, Floodplain & Floodway	Roadside and Structure Aesthetics Design	Roadway Construction Details	
Documentation of Project Scope, Schedule and Budget		Report Preparation & Documentation	Evaluate Guardrail Length of Need	Bridge Hydraulics and Scour Protection Analysis & Design	Seeding & Re-vegetation Design	Design Support	
Design Exceptions & Variances		Existing Conditions Analysis	Construction Details	Report Preparation & Documentation	Landscape and Irrigation Design		
Change of Access Reports			Calculations: Superelevation, Alignment, Drainage	Drainage Permits			
			Design Management & Coordination				
			Model and Calculate Earthwork Quantities				
			Prepare Cost Estimates				

Where Do We Fit In?



Roadway Design Teams
Assist in Addressing
Construction Questions
and Providing Technical
Guidance for Construction
Related Matters

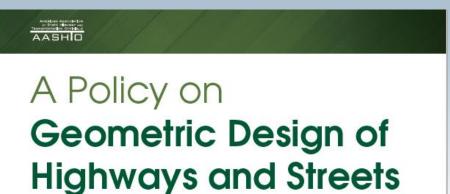
Roadway Design Teams Assist in the Preparation of Bid Documents and Address Bid RFIs

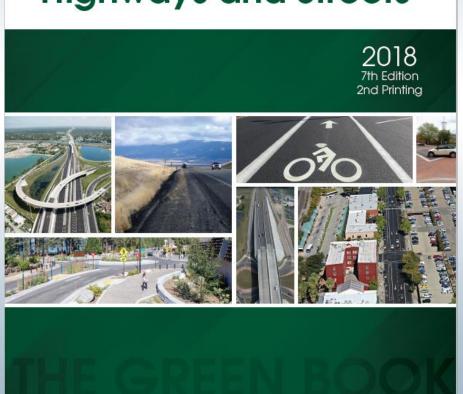


Roadway Design Teams Provide Critical Input into Development of a Project's Scope, Schedule and Budget

What Do We Use?







ARIZONA DEPARTMENT OF TRANSPORTATION

ROADWAY ENGINEERING GROUP

ROADWAY DESIGN GUIDELINES



MAY 2012

For future updates go to:

http://www.azdot.gov/highways/Roadway_Engineering/Roadway_Design/ Guidelines/Manuals/PDF/RoadwayDesignGuidelines.pdf

DOC 31-089

What Do We Use?



ARIZONA DEPARTMENT OF TRANSPORTATION



ARIZONA DEPARTMENT OF TRANSPORTATION



PAVEMENT DESIGN MANUAL

September 29, 2017

ROADWAY ENGINEERING GROUP PAVEMENT DESIGN SECTION

ADOT

Arizona Department of Transportation

Erosion and Pollution Control Manual For Highway Design and Construction









HIGHWAY DRAINAGE DESIGN MANUAL HYDRAULICS

Final Report

January, 2007

Arizona Department of Transportation 206 South 17th Avenue Phoenix, Arizona 85007

What Do We Use?





An Arizona Management System Agency

Douglas A. Ducey, Governor John S. Halikowski, Director Dallas Hammit, State Engineer Steve Boschen, Division Director

Arizona Department of Transportation Guiding Principles for Performance-Based Practical Design

Date: March 14, 2019

Introduction & Overview

This document has been prepared to provide guidance on using Performance-Based Practical Design (PBPD) in the development of Arizona Department of Transportation (ADOT) projects. PBPD is not intended to replace existing design standards or project development processes, but provides flexibility and encourages project development professionals to diligently evaluate design decisions and alternatives. Utilizing the PBPD approach will help ensure that designs meet the project's objective and need, resulting in the most optimized performance of the roadway system.

The Federal Highway Administration (FHWA) has defined PBPD as a decision-making approach that relies on quantitative analyses to guide decision-making throughout the project development process resulting in a better system performance. The PBPD approach combines the <u>Practical Design</u> philosophy of designing roadway facilities that makes the best use of financial resources to optimize performance, with the <u>Performance-Based Design</u> philosophy of evaluating the effects the roadway features have on its actual performance. By focusing on the overall system performance, PBPD helps agencies better manage their transportation investment and serve system-level needs and performance priorities with the limited resources it has.

It is expected that all ADOT project development professionals and consultants will apply the PBPD approach on every project by incorporating:

- Clear project objective and need statements that document the Departments performance objectives for the project.
- Performance-based, data-driven decision making.
- Practical Design methodology that results in the most cost effective (efficient) design solution that meets the project objective and optimizes system performance.
- Consideration of design alternatives that address and support the documented project objectives and need, while maximizing system improvements. Evaluation of more than one design option is inherent in the performance-based approach.

Performance Based Practical Design (PBPD):

ADOT's Goal is to deliver projects that:

- 1. Maintain or improve the operational performance of the roadway system.
- 2. Are the most cost effective solution to meeting the Project Objective and Need.
- PBPD is a decision-making approach that relies on quantitative analysis to guide decision-making throughout the project development process resulting in a better system performance.
- PBPD combines "<u>Practical Design</u>" philosophy of designing roadway facilities that makes the best use of the financial resources to optimize performance, with the "<u>Performance-Based Design</u>" philosophy of evaluating the effects the roadway features have on its actual performance.
- **PBPD** helps agencies better manage their transportation investment and serve system-level needs and performance priorities with the limited resources it has.
- PBPD is not intended to replace existing design standards or project development processes. PBPD provides flexibility and encourages professionals to diligently evaluate design decisions and alternatives.

ARIZONA DEPARTMENT OF TRANSPORTATION 1801 W Jefferson St. | Phoenix, AZ 85007 | azdot.gov

ADOT

Scoping & Pavement Design

089 CN 544 F0237 01C NHPP-089-E(208)T HORSESHOE BEND OVERLOOK SOUTH OF PAGE BITTER SPRINGS - UTAH STATE LINE HIGHWAY US 89

AASHTO CONTROLLING DESIGN CRITERIA REPORT MAY 26, 2020



PREPARED BY KATHRYN HAMMOND ROADWAY PREDESIGN SECTION



ADOT PROJECT NAME: HORSESHOE BEND OVERLOOK SOUTH OF PAGE

Project No. 089 CN 544 F0237 01C

ATTACHMENT 1 - VERTICAL CURVE INVENTORY

PROJECT NO:	089 CI	N 544 F0237	01C										
ROADWAY TYPE: UNDIVIDED ROADWAY (BI-DIRECTIONAL)													
VPI STATION	ON MILEPOST		GRADE (%)		CURVE	CURVE	STOPPING SIGHT DISTANCE (FT)		SPEED (MPH)				
(FT)	BEGIN	END	APPROACH	DEPARTURE	LENGTH (FT)	TYPE	EXISTING	KEQUIKED	EXISTING	POSTED			
1215+00.00	544.00	544.11	-1.4000	-2.5000	600.00	Crest	1281	675	95	65			
1225+00.00	544.19	544.30	-2.5000	-1.1430	600.00	Sag	+9999	675	+100	65			
1232+00.00	544.32	544.43	-1.1430	-2.2500	600.00	Crest	1275	672	95	65			
1240+00.00	544.47	544.58	-2.2500	-1.2000	600.00	Sag	+9999	672	+100	65			
1250+00.00	544.66	544.77	-1.2000	-2.5860	600.00	Crest	1078	676	86	65			
VPI STATION	MILEPOST		GRADE (%)		CURVE	CURVE	STOPPING SIGHT	ING SIGHT DISTANCE (FT)		SPEED (MPH)			
(FT)	BEGIN	END	APPROACH	DEPARTURE	LENGTH (FT)	TYPE	EXISTING	REQUIRED	NEW	DESIGN			
1215+00.00	544.00	544.11	-1.4000	-2.5000	600.00	Crest	1281	592	95	60			
1225+00.00	544.19	544.30	-2.5000	-1.1430	600.00	Sag	+9999	592	+100	60			
1232+00.00	544.32	544.43	-1.1430	-2.2500	600.00	Crest	1275	589	95	60			
1240+00.00	544.47	544.58	-2.2500	-1.2000	600.00	Sag	+9999	589	+100	60			
1250+00.00	544.66	544.77	-1.2000	-2.5860	600.00	Crest	1078	593	86	60			
VPI STATION	TATION MILEPOST		GRADE (%)		CURVE	CURVE	STOPPING SIGHT	T DISTANCE (FT)	SPEED (MPH)				
(FT)	BEGIN	END	APPROACH	DEPARTURE	LENGTH (FT)	TYPE	EXISTING	REQUIRED	NEW	POSTED			
1215+00.00	544.00	544.11	-1.4000	-2.5000	600.00	Crest	1281	514	95	55			
1225+00.00	544.19	544.30	-2.5000	-1.1430	600.00	Sag	+9999	514	+100	55			
1232+00.00	544.32	544.43	-1.1430	-2.2500	600.00	Crest	1275	512	95	55			
1240+00.00	544.47	544.58	-2.2500	-1.2000	600.00	Sag	+9999	512	+100	55			
1250+00.00	544.66	544.77	-1.2000	-2.5860	600.00	Crest	1078	515	86	55			

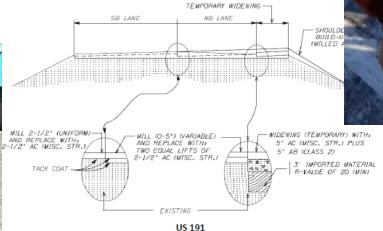
Meaning of Symbols:

GB = Grade Break – Stopping Sight Distance and Speed not calculated

= Existing Stopping Sight Distance less than AASHTO required value

Input grade Project Limi

TYPICAL SECTION 191 AP 323 F015001C / STBG-191-D(202)T CARRIZO WASH



CARRIZO WASH CBC (AT CBC APPROACHES) 1, 2



Data Collection & Field

Analysis/Research





Scoping & Pavement Design

Project 101L MA 001 F0203 01C Federal ID Number – 888-A(234)T Agua Fria Freeway Interstate 10 (I-10) to Interstate 17 (I-17) State Route 101 Loop (SR 101L)

FINAL SCOPING LETTER

November 1, 2019

Revised February 25, 2020

Prepared For:



ARIZONA DEPARTMENT OF TRANSPORTATION TRANSPORTATION TECHNOLOGY GROUP

ARIZONA DEPARTMENT OF TRANSPORTATION * ROADWAY ENGINEERING GROUP

205 SOUTH 17TH AVENUE * PHOENIX, AZ 85007 * PHONE: 602.712.7360

May 28, 2020

MATERIALS DESIGN REPORT

Report Type: Revised Final (Rev. 1) Report # 19-12-RF1

HIGHWAY NAME: ST JOHNS-SANDERS HWY (US 191)

PROJECT NAME: CARRIZO WASH

PROJECT NUMBER: 191 AP 323 F015001C / STBG-191-D(202)T

PROJECT SCOPE: DRAINAGE IMPROVEMENT

MILE POST LIMITS: MP 323.53 AND MP 324.03

Prepared by:

Pavement Design Section Roadway Engineering Group Arizona Department of Transportation

Design Reports & Documentation



Survey

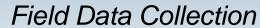


Mapping and Research

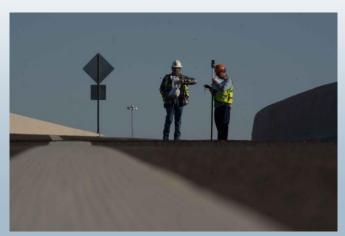
ADOT

Survey



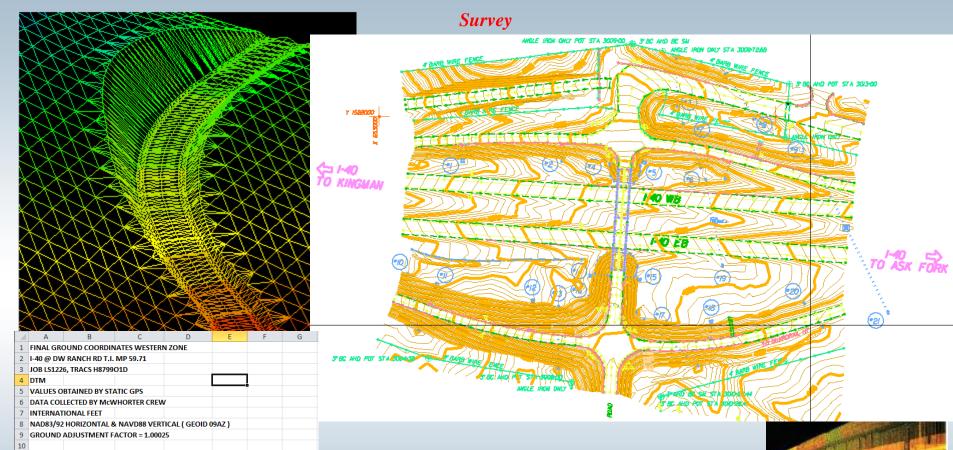












- Digital Terrain Models
- 3D Scans

11 PT. NO.

GROUND (N) GROUND (E)

1006 1527347.914

1007 1527350.601

1008 1527350.563

1009 1527350.589

1010 1527350.098

1011 1527368.388

1012 1527367.877

1013 1527384.167

1014 1527383.104

653564.973

653564.278 653570.288

653584.892

653566,903

653566.857

653572.700

653573.414

653586.077

653587.165

653567.664

DESC.

CLS ST

EP ST

GB ST

CLS

DS ST * 6INCH

GR ST * 2.9FT ON 6IN CURB

4111.218

4111.014

4111.108

4111.171

4111.271

4111.045

4111.307

4111.040

4111.155

4111.045

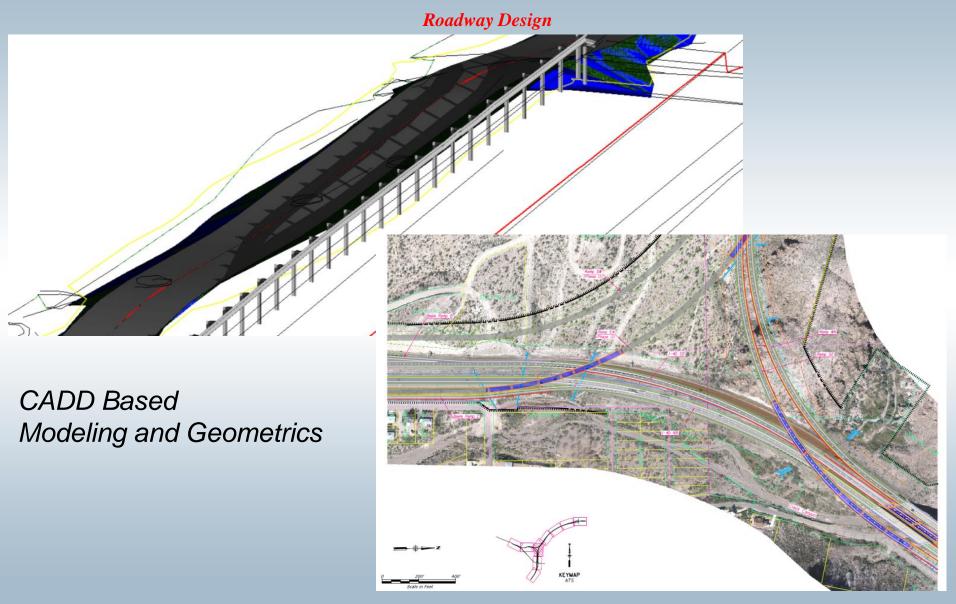
4111.198

4111.128

4110.771

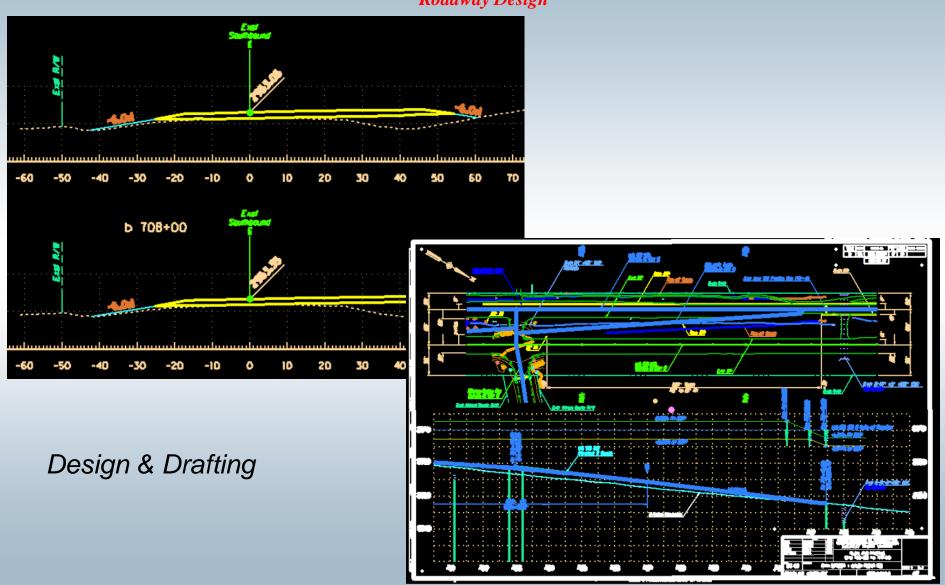
- Topographic Maps





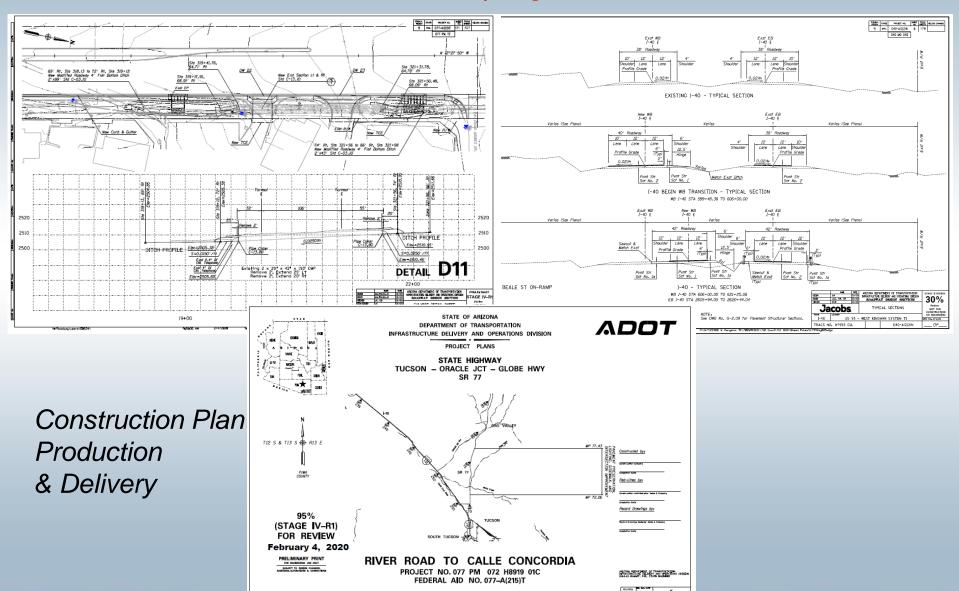


Roadway Design



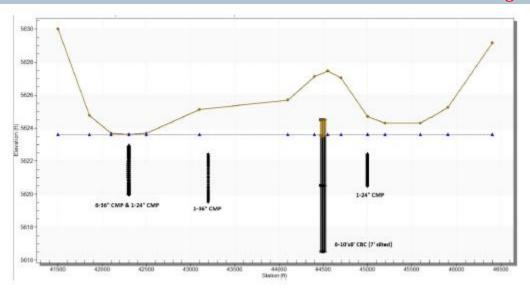


Roadway Design





Drainage



USGS Flow Gauge

Carrizo Wash

1' + opening remaining

Photo 1: Siltation at Inlet of Existing 6 - 10'X8' CBC located at Carrizo Wash, MP 323.85

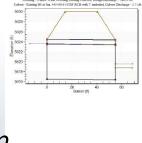
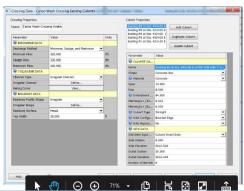


Figure 4. US 191 Roadway center line profile and existing culverts.



Roadway overtopping at around Sta. 432+00 South of Existing Box Culvert.

- Data Collection
- Field Analysis
- Calculations& Modeling





US 191 - Carrizo wash

Revised Final Drainage Report

TRACS NO. F015001D

Prepared for: Arizona Department of Transportation



November 2019

Prepared by Arizona Department of Transportation

Khandaker Haque, PE

Abu S Mohsenin

Drainage

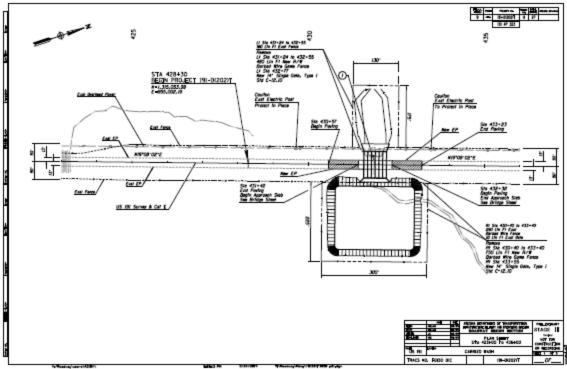




Figure 5: FEMA Flood Zone

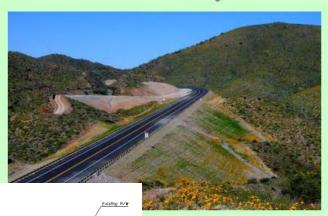
- Design Reports & Documentation
- Construction Details & Plans
- Floodplain Modeling

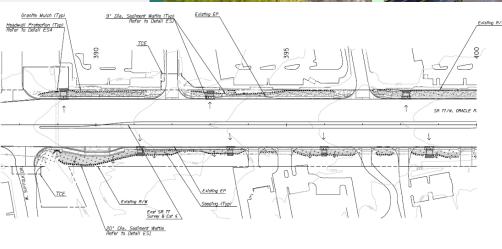


Roadside Development

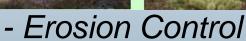
Roadway Group Roadside Development Section











- Landscape Design
- Aesthetics



Questions

